

PWP Mod. 1 – Auxiliary Unit Test & Inspection Procedures

References:

- (1) 7556850, PWP Mod. 1, Auxiliary Unit Assembly
- (2) 7556860, PWP Mod. 1, Auxiliary Junction Enclosure Assembly and Details
- (3) 7556853, PWP Mod. 1, Cooling Water Return Spool

1.0 AU VISUAL INSPECTION. Complete the following inspections prior to applying power to the unit. Record the results of this inspection in the data sheet. If item is satisfactory without adjustment or repair, check the SAT box on the data sheet; if repair or adjustment is required, check the “SAT w/ Repair” box on the data sheet.

- a. Verify that the nameplate (ref. 1, pc 65) is attached to the top of the AU.
- b. Verify that the valves are all labeled. The following valve labels should be visually verified: AVA, AVB, BVA, BVB, CVA, CVB, DVA, DVB, FSA, FSB, RVA, and RVB (ref. 1, pcs 52-57, 59-64).
- c. Verify that the filter is labeled F1 (ref. 1, pc 58).
- d. Verify that the each electrical enclosure has a nameplate (ref. 2, pc 11) and an electric shock hazard sticker (ref. 2, pc 12) attached.
- e. Verify that the check valves (ref. 3, pc 16) are oriented to allow free flow from the –12 size JIC 37° flare fittings (ref. 3, pc 7) to the outlet flange (ref. 3, pc 6).
- f. Verify that the each air manifold (ref. 1, pc 12) has a bleed valve (ref. 1, pc 11) installed in the bottom port.
- g. Verify that each air manifold has a nipple (ref. 1, pc 87), an elbow (ref. 1, pc 86), and a pressure switch wired assembly (ref. 1, pc 83 or 84) installed.
- h. Verify that plugs (ref. 1, pc 24) are installed in all unused ports on the air manifolds.
- i. Verify that cap nuts (ref. 1, pc 18) are installed on the four –12 size JIC 37° flare fittings on the pipe spools.
- j. Verify that the compression fittings on the flow switch wired assemblies (ref. 1, pcs 5 and 6) are oriented so that connections can be made from the rear of the AU to these switches.
- k. Verify that the large mufflers have been installed in ports 3 and 5 of the ram control valves, RVA and RVB, and in the EXH port on the blocking valves, BVA and BVB.
- l. Verify that all the union fittings on the pipe spools are tight.
- m. Verify that the electrical cables have been attached to the correct devices. Check that the label on the cable matches the device to which it is attached.

- n. Verify that the air hoses are routed correctly per the following table. Note that air manifold port numbers start with port 1 at the top.

Hose Designation	Routed from	Routed to
H101A DVA	Air manifold "A" port 2	DVA port 1 (center)
H104A BVA	Air manifold "A" port 1	BVA "IN" port (front)
H105A RVA	BVA "CYL" port (rear)	RVA port 1 (center)
H108A CVA	Air manifold "A" port 4	CVA port 1 (bottom)
H101B DVB	Air manifold "B" port 2	DVB port 1 (center)
H104B BVB	Air manifold "B" port 1	BVB "IN" port (rear)
H105B RVB	BVB "CYL" port (front)	RVB port 1 (center)
H108B CVB	Air manifold "B" port 4	CVB port 1 (bottom)

Table 1. AU Hose Routing

- 2.0 **FUNCTIONAL TEST.** The test procedure outlined below is described for the "A" side of the AU. These tests must be repeated for the "B" side of the AU as well. In the steps below, "A" side hoses, cables, and valves are designated by HXXXXA, WXXXXA, or XXA. When repeating these tests for the "B" side, substitute "B" for "A" in all hose, cable and valve designations.

2.1 Door Control Valve Test

- a. Close manually operated air isolation valves AVA and AVB.
 - b. Attach a regulated air source to the air inlet fitting at the rear of the AU. Regulate the air pressure to 60 psig.
- Note:** Air will flow from the door control valve DVA when AVA is opened. It may be advantageous to throttle air flow with valve AVA to reduce noise levels.
- c. Open manually operated air isolation valve AVA.
 - d. Apply 110 VAC to pins B and E of connector J2 on the rear of the "A" side electrical junction enclosure. This will cause the door control valve DVA solenoid L3 to energize and shift the valve to the unlock position.
 - e. Remove 110 VAC from pins B and E of connector J2. The door control valve will remain shifted to the unlock position.
 - f. Verify that air flows from port 2 of the door control valve DVA.
 - g. Apply 110 VAC to pins B and C of connector J2. This will cause the door control valve DVA solenoid L2 to energize and shift the valve to the lock position.
 - h. Remove 110 VAC from pins B and C of connector J2. The door control valve will remain shifted to the lock position.
 - i. Verify that air flows from port 4 of the door control valve DVA.
 - j. Close manually operated air isolation valve AVA.
 - k. Cap ports 2 and 4 on the door control valve DVA.

2.2 Ram Control Valve Test

- a. Open manually operated air isolation valve AVA.

- b. Apply 110 VAC across pins H and L of connector J2 on the rear of the “A” side electrical junction enclosure. This will cause blocking valve BVA solenoid L7 to energize.
- c. Verify that air flows from either port 2 or port 4 of the ram control valve RVA.
- d. Remove the 110 VAC from pins H and L of connector J2.
- e. Verify that air stops flowing at the ram control valve RVA.
- f. Apply 110 VAC to pins H and L of connector J2. This will cause the blocking valve to open.
- g. Apply 110 VAC to pins B and F of connector J2. This will cause the ram control valve RVA solenoid L5 to energize and the ram control valve will shift to the extend position.
- h. Remove 110 VAC from pins B and F. The ram control valve will remain shifted to the extend position.
- i. Verify that air flows from port 2 on the ram control valve RVA.
- j. Apply 110 VAC to pins B and G of connector J2. This will cause the ram control valve RVA solenoid L6 to energize and the ram control valve will shift to the retract position.
- k. Remove 110 VAC from pins B and G. The ram control valve will remain shifted to the retract position.
- l. Verify that air flows from port 4 on the ram control valve RVA.
- m. Remove 110 VAC from pins H and L of connector J2.

2.3 Cooling Water Valve Test

- a. Apply 110 VAC to pins B and A of connector J2.
- b. Verify that the cooling water ball valve CVA rotates to the open position.
- c. Remove 110 VAC from pins B and A of connector J2.
- d. Verify that the cooling water ball valve CVA rotates to the closed position.

2.4 Air Flow Switch Test

- a. Use a volt/ohm meter to check the resistance across pins J and K in connector J2. The reading should show an open circuit (infinite resistance).
- b. Draw a slight vacuum on the vacuum port or the pressure switch FSA.
- c. The resistance reading across pins J and K in connector J2 should change to show a closed circuit (zero resistance).
- d. Release the vacuum on FSA.

2.5 Pressure Switch Test

- a. Use a volt/ohm meter to check the resistance across pins J and M in connector J2. The reading should show an open circuit (infinite resistance).
- b. Increase the regulated air pressure slowly from 60 psi to 120 psi.
- c. Using the volt/ohm meter, note the approximate pressure where the resistance across pins J and M in connector J2 changes to a closed circuit (zero resistance). Record this pressure:_____.

- d. Decrease the regulated pressure slowly from 120 psi to 60 psi.
- e. Using the volt/ohm meter, note the approximate pressure where the resistance across pins J and M in connector J2 changes to an open circuit (infinite resistance). Record this pressure:_____.

2.6 B-Side Tests. Repeat all tests in sections 2.1 thru 2.5 on the “B” side of the auxiliary unit.

3.0 WATER AND AIR TIGHTNESS TESTS

3.1 Hydrostatic Test. The AU must be hydrostatically tested to 275 psi to assure there are no leaks. Record the results of this test in data sheet. Note any leaks repaired. The test procedure outlined below is described for the “A” side of the AU. These tests must be repeated for the “B” side of the AU as well. In the steps below, “A” side hoses, cables, and valves are designated by HXXXXA, WXXXXA, or XXXA. When repeating these tests for the “B” side, substitute “B” for “A” in all hose, cable and valve designations.

- a. Connect a water source capable of 275 psi to the inlet (lower) flange at the rear of the AU. This source should have a valve to control flow and isolate pressure. This valve should remain closed at this time.
- b. Connect the upper flange at the rear of the AU to a drain. This line should contain a valve to control flow and isolate pressure. This valve should be open.
- c. Remove the cap nuts from each of the four hose fittings on the rear of the AU.
- d. Connect a loop of 3/4-inch nominal ID hose between the “A” side fittings (-12 size JIC 37° male flare fittings) on the AU pipe spools.
- e. Apply 110 VAC to pins A and B on connector J2 on the rear of the “A” side electrical junction enclosure. This will cause the cooling water valve CVA to rotate to the open position.
- f. Turn on the water at low pressure and allow the AU to fill until water runs freely from the valve on the drain connection.
- g. Close the valve on the drain connection.
- h. Pressurize the AU water loop to 275 psi and hold for 15 minutes. Visually inspect all fittings and joints for leaks. Verify that water is not leaking from the “B” side isolation valve CVB or from the “B” side check valve. All leaks must be repaired and the AU must be held at 275 psi for 15 minutes after the last repair to assure all joints are tight.
- i. Vent all pressure from the AU water loop by closing the inlet isolation valve and opening the drain valve.
- j. Remove 110 VAC from pins A and B on connector J2.
- k. Remove the loop of hose from the “A” side pipe spools.
- l. Repeat steps “d” thru “k” above for the “B” side of the AU.
- m. Remove the water source from the inlet flange and remove the drain from the outlet flange.
- n. Allow water to drain from the pipe spools and reinstall the cap nuts on the four hose fittings.

3.2 Air Tightness Test. The AU air system must be tested to 120 psi to assure there are no leaks. Record the results of these tests in the data sheet. Note any leaks repaired. The test procedure outlined below is described for the “A” side of the AU. These tests must be repeated for the “B” side of the AU as well. In the steps below, “A” side hoses, cables, and valves are designated by HXXXXA, WXXXXA, or XXXA. When repeating these tests for the “B” side, substitute “B” for “A” in all hose, cable and valve designations.

- a. Close manually operated air isolation valves AVA and AVB.
- b. Attach a 120 psi air source to the air inlet fitting on the rear of the AU.
- c. Open the bleed valve at the bottom of the “A” side air manifold.
- d. Hold 120 psi for 5 minutes. Use soap solution on the bleed valve on the “A” side to check for leakage. No leakage assures that valve AVA is tight.
- e. Close the bleed valve in the bottom port of the “A” side air manifold.
- f. Cap ports 2 and 4 on the door control valve DVA and ram control valve RVA.
- g. Open manually operated air isolation valve AVA.
- h. Apply 110 VAC to pins B and C on connector J2 on the rear of the “A” side of the AU junction enclosure. This will shift the door control valve to the unlock position.
- i. Remove 110 VAC from pins B and C on connector J2. This will leave the door control valve shifted to the unlock position.
- j. Apply 110 VAC to pins B and F on connector J2. This will shift the ram control valve to the extend position.
- k. Remove 110 VAC from pins B and F on connector J2. This will leave the ram control valve shifted to the extend position.
- l. Hold 120 psi for 5 minutes. Use soap solution on all pressurized joints to check for leaks. Leaks should be repaired and pressure must be held for 5 minutes after the last repair.
- m. Apply 110 VAC to pins B and E on connector J2. This will shift the door control valve to the lock position.
- n. Remove 110 VAC from pins B and E on connector J2. This will leave the door control valve shifted to the lock position.
- o. Apply 110 VAC to pins B and G on connector J2. This will shift the ram control valve to the retract position.
- p. Remove 110 VAC from pins B and F on connector J2. This will leave the ram control valve shifted to the retract position.
- q. Apply 110 VAC to pins B and A on connector J2. This will cause the cooling water valve CVA to rotate to the open position.
- r. Hold 120 psi for 5 minutes. Use soap solution on all pressurized joints to check for leaks. Leaks should be repaired and pressure must be held for 5 minutes after the last repair.
- s. Remove 110 VAC from pins B and A on connector J2. Cooling water valve CVA should close.
- t. Close manually operated air isolation valve AVA.
- u. Open the vent valve in the “A” side air manifold to allow pressure to bleed off the “A” side air loop.
- v. Remove the caps from ports 2 and 4 of the door control valve DVA and the ram control valve RVA.
- w. Repeat steps “c” thru “v” above for the “B” side air loop.

PWP Mod. 1 – CMU Test & Inspection Procedures

References:

- (1) 593-7556811, PWP Mod. 1, CMU Assembly
- (2) 593-7556812, PWP Mod. 1, CMU Door Assembly
- (3) 593-7556834, PWP Mod. 1, CMU Safety Cover Modification and Assembly
- (4) 593-7556840, PWP Mod. 1, CMU Rear Electrical Enclosure Conversion
- (5) 593-7556850, PWP Mod. 1, Auxiliary Unit Assembly

1.0 VISUAL INSPECTION. Complete the following inspections prior to applying power to the CMU or the rear enclosure. Remove the CMU side and front guards to aid in visual inspection. Record the results of this inspection in the data sheet. If item is satisfactory without adjustment or repair, check the SAT box on the data sheet; if repair or adjustment is required, check the “SAT w/ Repair” box on the data sheet.

1.1 CMU. Note: Part numbers given without accompanying reference drawing are from reference (1).

- a. Verify that the safety cover assembly (pc 48) sits entirely within the 25.50/25.44 width of the upper frame top plate (pc 59).
- b. Open the safety cover. Verify the following items:
 - ? Verify visually that both gas springs (pc 70) are installed.
 - ? Verify that the plastic retainer caps are installed on each end of each gas spring.
 - ? Verify visually that the ball studs (pc 61) on the safety cover are installed in the holes closest to the front of the safety cover.
 - ? Verify that the gas springs are charged. Fully raise the safety cover and release it; the safety cover should remain in the open position when released.
 - ? Verify that both bumpers (ref. 3, pc 5) are installed.
 - ? Verify that the bumpers are screwed as far into the safety cover as possible.
- c. Close the safety cover and latch the toggle latch (pc 73). Verify the following items:
 - ? The latch should toggle and snap into the locked position.
 - ? The catch should engage. The toggle should not be able to be released unless the catch lever is released first.
 - ? The gap between the bottom of the safety cover and the upper frame top plate should be less than 0.09 inch on average.
- d. Verify that the cables and hoses on top of the door are properly routed and secured as shown on reference (1), section 52-A. Verify the following:
 - ? Verify visually that the cable loop clamp (pc 78) is installed on the hinge bracket (ref. 2, pc 12).
 - ? Verify that the door power cable W102 (pc 6) is routed in a loop as shown on ref. (1) and is secured in the cable loop clamp.
 - ? Verify that air hose H103 (pc 31) and air hose H102 (pc 32) are secured to the power cable.
 - ? Verify that the door thermostat TS1 (pc 3) and the door overtemp switch TS4 (pc 2) are tied to the cable and hose bundle with slack in the orange silicon leads.
 - ? Verify that the cable and hose bundle is secured approximately every 6 inches with blue high temperature wire ties (pc 150).
 - ? Verify that the cable from limit switch LS1, W110 (pc 8), is **NOT** secured to the cable and hose bundle from the door. Cable W110 should run independently of the remainder of the cable and hose bundle.
- e. Verify visually that the door water hoses are correctly routed as shown on reference (1), section 52-A. Verify the following:
 - ? Verify that the lower hose (pc 28) is secured to the door with a cable loop clamp (pc 78).
 - ? Verify that the upper hose (pc 29) is securely tied to the lower hose with blue high temperature ties (pc 150).

- f. Verify visually that in the unlocked position, the door pneumatic cylinder (ref. 2, pc 24) is bottomed in the extended direction. That is, the cylinder bottoms to stop the unlocking motion rather than some other piece of the door assembly contacting a stationary piece of the CMU assembly.
- g. Verify that the spherical rod end bearing (ref. 2, pc 25) on the pneumatic cylinder rod is tightly jammed against the rod shoulder.
- h. Cycle the door manually from unlocked to locked to unlocked as many times as required to observe the hoses and cables on top of the door to assure freedom of motion. Verify the following:
 - ? The orange leads from the thermostats TS1 and TS4 (pcs 3 and 2, respectively) have slack in them and neither is binding, kinking, or pulling.
 - ? The blue water hoses (pcs 28 and 29) are sliding freely in the slot in the upper frame top plate and are not pulling or kinking.
- i. Lock the door manually. Verify that the trailing edges of the door pivot lugs (ref. 2, pc 17) are flush with the leading edges of the stationary locking lugs (pc 40) within $-0/+ .25$ inch. Note: The door pivot lugs may be flush with the locking lugs or sticking out up to .25 inch. They may not be under the locking lugs.
- j. With the door still locked, verify that all four pivot lugs are making contact with the locking lugs. Each lug location should preclude a 0.002-inch feeler gauge over at least half of the lug contact area.
- k. Verify that the locked door fully contacts the top of the chamber (pc 13). The door/chamber interface should preclude a 0.005-inch feeler gauge everywhere.
- l. Manually unlock the door. Verify that both detent rods (ref. 2, pc 7) disengage and reengage the hinge pin brackets (ref. 2, pc 4) when the latch handle (ref. 2, pc 15) is operated.
- m. Verify that the jam nuts on the detent mechanism (ref. 2, pc 46) are tightly jammed against the turnbuckle nuts (ref. 2, pc 23).
- n. Verify visually that the clevis pins (ref. 2, pc 30) do not hang up on the hinge bracket (ref. 2, pc 12) when the detent mechanism is operated.
- o. Verify visually that the cotter pins and washers (ref. 2, pcs 32 and 48) are installed correctly; that is, to the outside of the crank arm (ref. 2, pc 6).
- p. Open the door to the 45° position and verify that both detent rods reengage the holes in the hinge pin brackets and hold the door in the open position when the latch handle is released.
- q. Verify that the door assembly does not hit the safety cover in the open position.
- r. Cycle the door one or more times from open to close to open. Observe the hoses and wires on top of the door to assure there is no kinking or pulling.
- s. Verify visually that the cables and hoses under the ram are properly routed and secured as shown on reference (1), section 46-A. Verify the following:
 - ? Verify that the ram power cable W103 (pc 7) and the two blue water hoses (pc 30) are routed on one side of the cable carrier (pc 65) divider.
 - ? Verify that the TS2 and TS5 thermostat cables, W115 and W118, respectively, (pcs 5 and 4) are routed on the other side of the cable carrier divider.
 - ? Verify that the thermostat cables are secured by two cable-loop clamps (pc 77). Where the orange silicon wire leads pass thru the first loop clamp, all four leads should be inside the clamp. Where the cable jackets pass thru the second loop clamp, only one cable jacket is inside the clamp and the other cable is attached to the first with blue high-temperature wire ties (pc 150).
 - ? Verify that the thermostat cables have slack in the orange silicon lead wires.
 - ? Verify that the thermostat cables are routed around the ram adapter (pc 44) so as not to be damaged should the ram be lifted off the adapter.

- ? Verify that the blue water hoses are routed around the ram adapter so as not to be damaged should the ram be lifted off the adapter.
 - ? Verify that 45-degree fitting on the ram power cable directs the cable horizontally in the direction of the water hoses.
 - ? Verify that the ram power cable is routed with and secured to the blue water hoses.
 - ? Verify that all hoses and cables are secured to the entrance of the cable carrier track (pc 65) with blue high-temperature wire ties (pc 150).
 - ? Verify that all hoses and cables are secured to the exit of the cable carrier track with white wire ties (pc 151).
- t. Verify that all limit switch covers are properly oriented and tight. Verify that all limit switch stuffing tubes are tight.
- u. Verify that the door and ram power cable connectors are screwed tightly to their respective receptacle connectors.
- v. Verify that the hazard placard (pc 154), warning placard (pc 153), side guard labels (pc 155), and CMU nameplate (pc 152) are installed as shown on reference (1), Detail 31-A.
- w. Verify that the unit serial number has been stamped on the nameplate.
- x. Verify that the four cleaning nozzles (pc 140) on the outside of the chamber are of the 90-degree head type. Verify that the nozzle outlets are pointing inward toward the chamber.
- y. Verify that the four cleaning nozzles (pc 139) on the inside of the chamber are of the 45-degree deflected spray type. Verify that the supporting setscrews (pc 108) are tight and that the nozzles are pointing outward toward the chamber.
- z. Verify that the cleaning nozzle (pc 138) in the rear of the CMU is aimed down toward the cable carrier.
- aa. Verify that all nozzles have been plumbed to the washdown manifold (pc 60) at the front of the CMU. Nozzles should be plumbed with white .38 OD teflon tubing (pcs 35, 36, 37, and 38).
- bb. Verify that there is a pipe plug (pc 143) in the end of the washdown manifold.
- cc. Verify that there is a hose washer in the garden hose fitting (pc 132) attached to the bottom of the washdown manifold.
- dd. Verify that air hoses (pcs 31, 32, 33, and 34) are properly marked and attached to the proper devices. Verify markings and devices per the following table.

Hose No.	Attached to	Cylinder End Designation	Free End Designation
H102	Door Cylinder Rear	H102 DR REAR	H102 DV P2
H103	Door Cylinder Front	H103 DR FRT	H103 DV P4
H106	Ram Cylinder Bottom	H106 RAM BOT	H106 RV P2
H107	Ram Cylinder Top	H107 RAM TOP	H107 RV P4

- ee. Verify that cables W110 – W118 (pcs 1 thru 11) are attached to the correct devices as shown in the following table.

Cable No.	Designation	Attached to
W110	LS1	Door Closed Limit Switch
W111	LS2	Safety Cover Closed Limit Switch
W112	LS3	Door Locked Limit Switch
W113	LS4	Ram Retracted Limit Switch

W114	TS1	Door Thermostat
W115	TS2	Ram Thermostat
W116	TS3	Chamber Thermostat
W117	TS4	Door Overtemp Switch
W118	TS5	Ram Overtemp Switch

1.2 REAR ELECTRICAL ENCLOSURE. Note: Part numbers given without accompanying reference drawing are from reference (4).

- a. Verify that the electrical hazard placard (pc 108), the nameplate (pc 112), and the instruction plate (pc 113) are installed as shown in reference (4), detail 19-A.
- b. Verify that the unit serial number has been stamped on the nameplate.
- c. Verify that fuses are installed in the fuse holders in accordance with the following table.

Fuse Designation	Ref (4) Pc No	Rating	P/N
F1 thru F6	Pc 53	600 V, 20A, fast acting	KLK20, ATM 20
F7 & F8	Pc 51	600 V, 0.3 A, class CC	KLDR.3
F9	Pc 52	250 V, 1 A, time delay	FLM1
F10	Pc 50	250 V, ½ A, time delay	FLM.5

- d. Verify that relay 1R2 (pc 67) is set for 30-second delay (50% of 1-minute scale).
- e. Verify that relay 1R3 (pc 68) is set for 3-minute delay (30% of 10-minute scale).
- f. Verify that the display unit cable assembly (pc 5) end connectors are screwed firmly to the PLC and the display unit.
- g. Verify that the cable bundle between the enclosure and the door passes thru the cable loop clamp (pc 20).
- h. Verify that the devices on the panel and the receptacles on the bottom of the enclosure are labeled in accordance with note 4.2 on reference (4).
- i. Verify that a watertight cap (pc 6) is installed on connector 1J7 on the bottom of the electrical enclosure.
- j. Verify that a watertight cap (pc 6) is installed on connector 1J8 on the bottom of the electrical enclosure.
- k. Verify that a watertight cap (pc 7) is installed on connector 1J1 on the bottom of the electrical enclosure.
- l. Verify that the large stuffing tube (pc 33) has a packing assembly installed.
- m. Verify that the small stuffing tubes (pc 32) have plugs installed.
- n. Verify that the Hubbell Junior stuffing tubes (pc 31) have packing assemblies installed. Verify that the caps are snug (so they don't fall off during shipping and handling).
- o. Verify that the wire label tags that will be placed on the field wires at installation are inside the enclosure.

2.0 WATER AND AIR TIGHTNESS TESTS

2.1 Hydrostatic Test. The CMU cooling loop must be hydrostatically tested to 275 psi to assure there are no leaks. Record the results of this test in data sheet. Note any leaks repaired.

- a. Connect a water pressure source capable of 275 psi to the inlet fitting (the –12 size fitting on the outboard side of the water manifold) at the rear of the CMU.

- b. Turn on the water at low pressure and allow the CMU to fill until water runs freely from the water outlet fitting (the -12 size fitting on the inboard side of the water manifold) at the rear of the CMU.
 - c. Cap the outlet fitting.
 - d. Bleed the CMU of air by cracking the hose fittings on top of the CMU door. Allow air to bleed and retighten hose fittings.
 - e. Pressurize the CMU water loop to 275 psi and hold for 15 minutes. Visually inspect all fittings and hoses for leaks. All leaks must be repaired and the CMU must be held at 275 psi for 15 minutes after the last repair to assure all joints are tight.
 - f. Vent all pressure from the CMU water loop.
- 2.2 Air Tightness Test. The CMU air system must be tested to 120 psi to assure there are no leaks. Record the results of these tests in the data sheet. Note any leaks repaired.
- a. The safety cover should be open and the CMU door closed.
 - b. Connect a shop air source capable of 120 psi to hose H103. Turn on air pressure and the door will lock.
 - c. Use soap solution on the door air cylinder rod end fittings and rod seals to detect leaks. All leaks must be repaired and H103 must be held at 120 psi for 5 minutes after the last repair to assure all joints are tight.
 - d. Vent pressure from H103.
 - e. Connect a shop air source capable of 120 psi to hose H102. Turn on air pressure and the door will unlock.
 - f. Use soap solution on the door air cylinder blind end fittings to detect leaks. All leaks must be repaired and H102 must be held at 120 psi for 5 minutes after the last repair to assure all joints are tight.
 - g. Vent pressure from H102.
 - h. Open the CMU door.
 - i. Connect a shop air source capable of 120 psi to hose H106. Turn on air pressure and the ram will extend.
 - j. Use soap solution on the ram air cylinder blind end fittings to detect leaks. All leaks must be repaired and H106 must be held at 120 psi for 5 minutes after the last repair to assure all joints are tight.
 - k. Vent pressure from H106.
 - l. Connect a shop air source capable of 120 psi to hose H107. Turn on air pressure and the ram will retract.
 - m. Use soap solution on the ram air cylinder rod end fittings and rod seals to detect leaks. All leaks must be repaired and H107 must be held at 120 psi for 5 minutes after the last repair to assure all joints are tight.
 - n. Vent pressure from H107.
- 3.0 SWITCH ADJUSTMENT CHECKS
- 3.1 Pre-Startup. This section requires the CMU to be connected to a rear electrical enclosure, an Auxiliary Unit, and a pendant electrical controller. The AU should have passed all tests and inspections in the latest revision of AU_TEST prior to being used in the following series of tests.
- a. Connect the cabling W110 thru W118 between the CMU and the rear electrical enclosure as shown in Section 15-B on drawing 7556810.

- b. Connect cable W109 between the CMU rear electrical enclosure (plug P2) and the Auxiliary unit electrical enclosure.
- c. Connect the pendant controller cable W108 to the rear electrical enclosure at plug P9.
- d. Connect the CMU Rear Electrical Enclosure to a 450 +/- 10 VAC power supply. Connect as shown in Detail 16-E on drawing 7556810. Do not turn on power to the CMU at this time.

Note: The following steps assume that the “A” side of the auxiliary unit (AU) is being used for testing. If the “B” side is used, substitute “B” valve designations (XXB) for the “A” valve designations (XXA) used below. See Figure 1 for plumbing described below.

- e. Connect hose H102 from the CMU to port 2 on the door control valve DVA on the AU. Connect hose H103 from the CMU to port 4 on the door control valve DVA on the AU.
- f. Connect hose H106 from the CMU to port 2 on the ram control valve RVA on the AU. Connect hose H107 from the CMU to port 4 on the ram control valve RVA on the AU.
- g. Close manually operated air isolation valves AVA and AVB on the Auxiliary Unit.
- h. Connect a low pressure air source (100 to 125 psi) to the Auxiliary Unit air inlet fitting. Leave manually operated air isolation valves AVA and AVB on the AU closed at this time.

WARNING: In steps “h” and “i” below, do not tighten the compression fittings when connecting the 3/8 OD tubing or the ferrules will be permanently attached to the tubing.

- i. Connect a length of 3/8-inch OD teflon tubing between the exhaust port elbow on the CMU and the pressure port on the air flow switch FSA on the AU. Note that the pressure port is on the rear (side where the mounting bracket is located) of the air flow switch. Do not tighten the compression fittings when making these connections; simply insert the hose.
- j. Connect a length of 3/8-inch OD teflon tubing between the exhaust duct connector on the CMU and the vacuum port on the air flow switch FSA on the AU. Note that the vacuum port is on the front (side where the electrical junction box is located) of the air flow switch. Do not tighten the compression fittings when making these connections; simply insert the hose.
- k. Connect a 4-inch diameter flexible exhaust duct to the exhaust duct connector on the rear of the CMU. The exhaust system shall have a fan calibrated to provide 100 +/- 10 CFM of air flow out of the CMU. Leave the fan off at this time.
- l. Interconnect between the CMU and the AU with 3/4-inch nominal ID hose with female –12 size SAE 37° flare swivel ends. Interconnect as shown in figure 1.
- m. Connect the inlet (lower) flange on the Auxiliary Unit to a cooling water source capable of flowing 10 to 30 GPM of cold fresh water. This water source shall have a shutoff valve in the line. Do not turn on the cooling water at this time.
- n. Connect the outlet (upper) flange on the Auxiliary Unit to a drain.

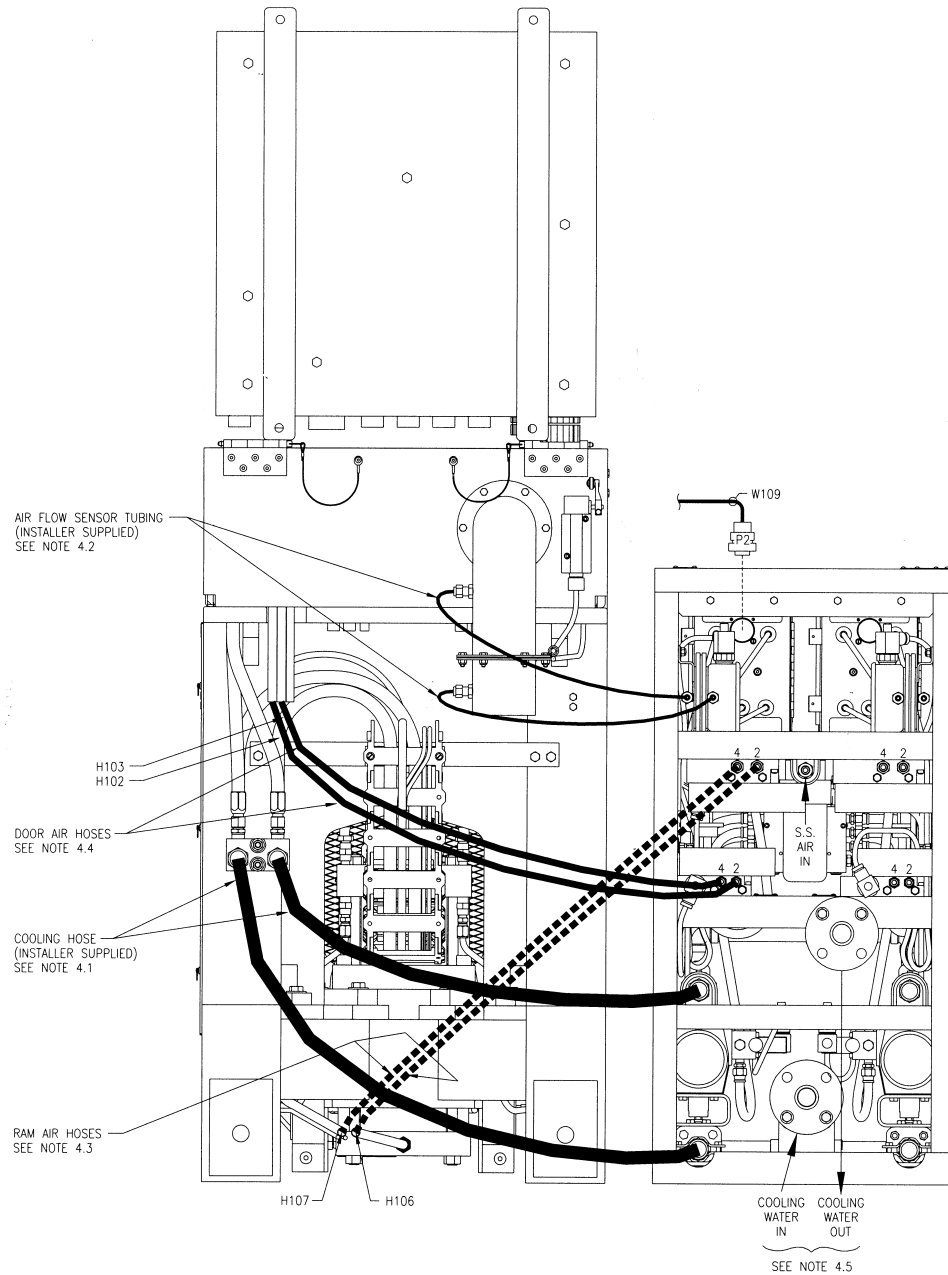


Figure 1. CMU to AU interconnections.

- o. Loosen the display unit cover on the CMU rear electrical enclosure so the function keypad can be accessed.
 - p. Loosen the clamps that secure the door on the REE so that the internal components can be accessed and inspected during the following procedures.
 - q. Open the CMU safety cover. The CMU door should be unlocked and closed.
- 3.2 **Startup.** The door control valve on the AU may be shifted to either the lock or unlock position on initial power up. The current position must be determined and the valve shifted to the unlock position
- a. Push in the emergency stop pushbutton on the CMU control pendant.
 - b. Turn on 450 VAC power to the CMU rear electrical enclosure.

CAUTION

If the program version is other than 0303, stop and install the current program version.

- c. Note CMU and CDU program versions at startup: PLC: _____, Display: _____
- d. The following message should be displayed after PLC startup: 08)PULL OUT E-STOP THEN PRESS RESET.
- e. Pull out the Emergency Stop pushbutton on the CMU pendant controller. The following message should be displayed: 02) MACHINE SHUTDOWN PRESS RESET.
- f. Open manually operated air isolation valve AVA on the AU.
- g. Note whether the CMU door remains unlocked or if it locks. If the door locks, manually over-ride solenoid 12 on the door control valve DVA on the AU to cause the door to unlock.
- h. Open the door.
- i. Press the RESET pushbutton.
- j. The ram should fully retract.
- k. Turn on cooling water flow at the AU inlet piping assembly.
- l. Turn on the CMU exhaust system fan.

3.3 AIR FLOW SWITCH ADJUSTMENT.

3.3.1 Air Flow Switch FSA. See reference (5) for location of FSA.

- a. Remove the cover from FSA electrical junction box.
- b. Use a nut driver to loosen the adjusting nut until there is no tension on the spring. PLC slot 1, light A5 should be lit.
- c. Tighten the adjusting nut until PLC slot 1, light A5 goes out.
- d. Loosen the adjusting nut just until PLC slot 1, light A5 comes back on.
- e. Loosen the adjusting nut an additional ½ turn.
- f. Turn the exhaust fan off. Verify the PLC slot 1, light A5 goes out.
- g. Turn the exhaust fan back on. Verify that PLC slot 1, light A5 lights up.
- h. If the conditions from steps “e” and “f” are met, adjustment is complete. Replace the cover on the junction box. If these conditions are not met, repeat steps “b” through “g” until satisfactory adjustment is achieved.

3.3.2 Air Flow Switch FSB Adjustment. See reference (5) for location of FSB.

- a. Press in the E-STOP pushbutton.
- b. Turn off 450 VAC power to the CMU.
- c. Turn off the exhaust fan.

- d. Move the AU cable W109 from the “A” side electrical enclosure to the “B” side electrical enclosure.
- e. Connect the vent lines from the CMU to the pressure and vacuum ports on FSB. Do not tighten the compression fittings.
- f. Turn on 450 VAC power to the CMU.
- g. Pull out the E-STOP pushbutton.
- h. Press the RESET pushbutton.
- i. Turn on the exhaust fan.
- j. Remove the cover from FSB electrical junction box.
- k. Use a nut driver to loosen the adjusting nut until there is no tension on the spring. PLC slot 1, light A5 should be lit.
- l. Tighten the adjusting nut until PLC slot 1, light A5 goes out.
- m. Loosen the adjusting nut just until PLC slot 1, light A5 comes back on.
- n. Loosen the adjusting nut an additional ½ turn.
- o. Turn the exhaust fan off. Verify that PLC slot 1, light A5 goes out.
- p. Turn the exhaust fan back on. Verify that PLC slot 1, light A5 lights up.
- q. If the conditions from steps “e” and “f” are met, adjustment is complete. Replace the cover on the junction box. If these conditions are not met, repeat steps “k” through “p” until satisfactory adjustment is achieved.
- r. Turn off the exhaust fan.
- s. Press the E-STOP pushbutton.
- t. Turn off 450 VAC power to the CMU.
- u. Move the AU cable W109 from the “B” side electrical enclosure to the “A” side electrical enclosure.
- v. Connect the vent lines from the CMU to the pressure and vacuum ports on FSA. Do not tighten the compression fittings.
- w. Turn on 450 VAC power to the CMU.
- x. Pull out the E-STOP pushbutton.
- y. Press the RESET pushbutton.

3.4 LIMIT SWITCH ADJUSTMENT.

3.4.1 Door Closed Limit Switch LS1 Adjustment. See ref. (1), Sections 52-A and 55-E for location of LS1. LS1 should have been adjusted when it was installed on the CMU. Complete the check in step “a” below. If adjustment is correct, skip to section 3.4.2. If adjustment is incorrect, complete the rest of this procedure.

- a. Open the safety cover and door. Slowly close the door and note the position where LS1 energizes (PLC slot 1, light A6 lights). LS1 should energize when the bottom of the door is 1.00 to 3.00 inches from the top of the chamber at the front. Record the value: _____ inches.

- b. Verify visually that the roller arm on LS1 is oriented upward at approximately a 15° angle. (Note: When the arm is rotated counterclockwise, the switch should energize when the arm is parallel to the top plate.)
- c. Close the CMU door until the bottom of the door is approximately 2 inches above the top of the chamber.
- d. Loosen the jam nut on the flag bolt and adjust the bolt up or down until LS1 energizes (PLC slot 1, light 6 lights).
- e. Retighten the jam nut.
- f. Open the door to the 45 degree position.
- g. Slowly close the door and note the position where LS1 energizes (slot 1, light A6 lights). LS1 should energize when the bottom of the door is 1.00 to 3.00 inches from the top of the chamber at the front. Record the value: _____ inches.
- h. If adjustment is not correct, repeat steps “b” through “g” until correct adjustment has been achieved.

3.4.2 Safety Cover Closed Limit Switch LS2 Adjustment. See ref (1), Section 52-A and Detail 50-E for location of LS2. LS2 should have been adjusted when it was installed on the CMU. Complete the check in step “a” below. If adjustment is correct, skip to section 3.4.3. If adjustment is incorrect, complete the rest of this procedure.

- a. Unlatch and raise the safety cover. Slowly close the safety cover and verify that the switch activates (PLC slot 2, light A7 lights) when the safety cover is fully closed (0.5-inch or less from the top plate). Record the distance between the bottom of the safety cover and the top plate when LS2 activates:_____
- b. Adjust the LS2 flag bracket (ref. 1, pc 23) so that the threaded rod (ref. 1, pc 109) is centered in the hole in the safety cover bracket.
- c. Adjust the threaded rod so that it protrudes .31-.38-inch beyond the back of the safety cover bracket when the safety cover is closed and pinned shut. See ref. (1), Detail 50-E.
- d. Close the safety cover and latch it shut.
- e. Loosen the limit switch lever arm cap screw so that lever arm is free to rotate on the limit switch shaft.
- f. Hold the lever arm roller in contact with the threaded rod.
- g. Rotate the switch shaft counterclockwise with a screwdriver until the switch activates (PLC slot 2, light A7 lights).
- h. Retighten the lever arm cap screw.
- i. Unlatch and raise the safety cover. Slowly close the safety cover and verify that the switch activates (PLC slot 2, light A7 lights) when the safety cover is fully closed (0.5-inch or less from the top plate). Record the distance between the bottom of the safety cover and the top plate when LS2 activates:_____
- j. If adjustment is not correct, repeat steps “b” through “i” until proper adjustment is achieved.

3.4.3 Door Locked Limit Switch LS3 Adjustment. See ref (1), Section 52-A and Detail 52-E for location of LS3. LS3 should have been adjusted when it was installed on the CMU. Complete steps “a” thru “e” below to check for correct adjustment. If adjustment is correct, skip to section 3.4.4; if incorrect, complete the rest of this procedure.

- a. Lock the CMU door by pressing function key F10 on the display unit keypad.

- b. Mark the location of the door pivot lug (ref. 2, pc 17) relative to the leading edge of the fixed locking lug (ref. 1, pc 40) with a washable or water-soluble marker. See Figure 2.
- c. Unlock the door by pressing function key F11 on the display unit keypad.
- d. Measure 0.38 inch to the left of the mark made in step “b” above and make another mark. Measure 0.88 inch to the left of the mark made in step “b” above and make another mark. See Figure 2.
- e. Bleed air pressure from the door lock cylinder and manually rotate the door to the locked position. The door locked limit switch LS3 should activate (PLC slot 1, light A8 lights) when the door has rotated so the leading edge of the fixed locking lug is between the two marks made in step “d” above. If adjustment is correct, skip to section 3.8; if not, continue with this procedure.
- f. Unlock the door. Remove the air cylinder and the shock absorber from the door
- g. Manually rotate the door to position the leading edge of the locking lug midway between the marks made in step “d” above.
- h. Loosen the limit switch lever arm cap screw so that lever arm is free to rotate on the limit switch shaft.
- i. Hold the lever arm roller in contact with the door locked switch flag (ref. 2, pc 10).
- k. Rotate the switch shaft counterclockwise with a screwdriver until the switch activates (PLC slot 1, light A8 lights).
- l. Retighten the lever arm cap screw.
- m. Manually rotate the door unlocked. Slowly rotate the door locked and verify that LS3 activates when the leading edge of the locking lug is between the marks made in step “d” above.
- n. If adjustment is correct, rotate the door to the unlocked position and re-install the air cylinder and the shock absorber. If adjustment is not correct, repeat steps “g” through “l” until satisfactory adjustment is achieved.
- o. Leave the door unlocked.

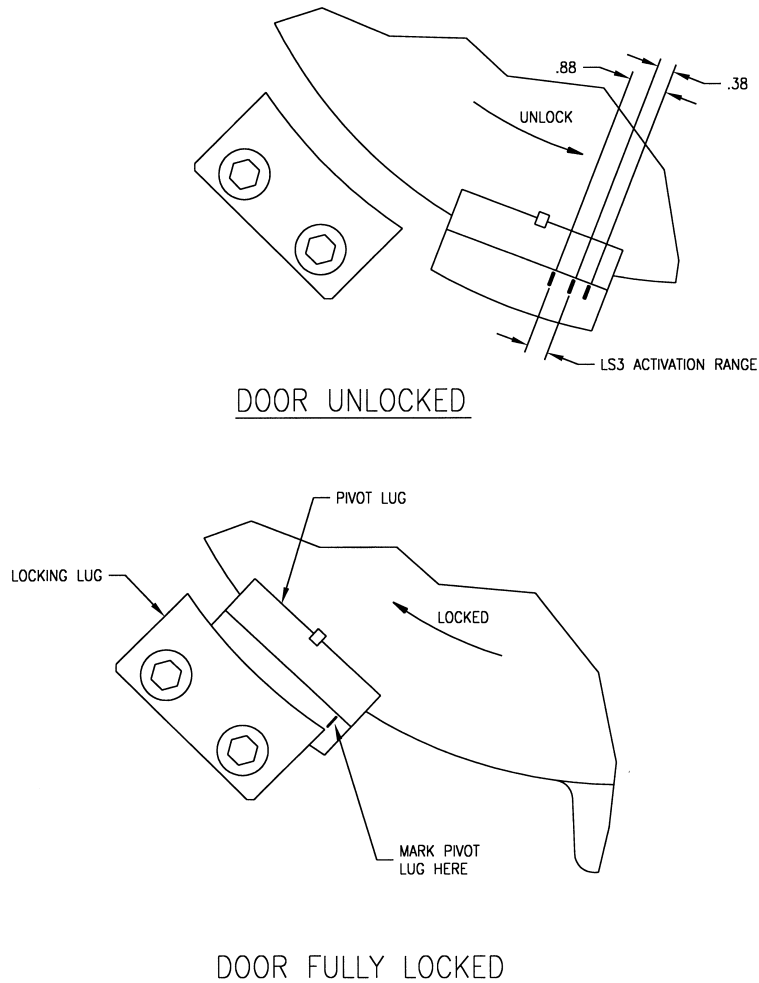


Figure 2. Door Locked Limit Switch Adjustment Check.

3.4.4 Ram Retract Limit Switch LS4 Adjustment. See ref. (1), Section 42-A for location of LS4. LS4 should have been adjusted when it was installed on the CMU. Complete steps “a” thru “d” below to check for correct adjustment. If adjustment is correct, skip to section 4.0; if incorrect, complete the rest of this procedure.

- a. Pull out the E-stop pushbutton and press the reset pushbutton.
- b. PLC slot 1, light B1 should be lit.
- c. Press function key F6 to extend ram. As soon as the ram rises from the bottom, PLC slot 1, light B1 should go out.
- d. Press function key F7 to retract ram. When the ram reaches the bottom of travel, PLC slot 1, light B1 should light.
- e. Leave the ram in the fully retracted position.
- f. Loosen the limit switch lever arm cap screw so that the lever arm is free to rotate on the limit switch shaft.
- g. Hold the lever arm roller in contact with the bottom of the ram skirt.

- h. Rotate the switch shaft counterclockwise with a screwdriver until the switch activates (PLC slot 1, light B1 lights).
- i. Retighten the lever arm cap screw.
- j. Press function key F6 to extend ram. As soon as the ram rises from the bottom, PLC slot 1, light B1 should go out.
- k. Press function key F7 to retract ram. When the ram reaches the bottom of travel, PLC slot 1, light B1 should light.
- l. If the requirements of steps “j” and “k” above are not met, repeat steps “e” through “k” until proper adjustment is achieved.

4.0 FUNCTIONAL TEST.

4.1 PRE-START-UP. Prior to beginning the functional test, verify that the following conditions are met.

- a. The PLC PROM and the display unit PROM are the latest revision.
- b. The CMU and rear electrical enclosure have passed visual inspection per section 1.0 of this procedure.
- c. The CMU cooling water loop has passed hydrostatic testing per section 2.1 of this procedure.
- d. The CMU air system has passed air tightness testing per section 2.2 of this procedure.
- e. Air flow switches FSA and FSB have been adjusted per section 3.3 of this procedure.
- f. Limit switches LS1 through LS4 have been adjusted per section 3.4 of this procedure.
- g. Shop air at 100 to 125 psi is turned on to the AU. Manual isolation valve AVA on the AU has been opened.
- h. Cooling water capable of flowing 10 to 30 GPM is turned on to the inlet flange of the AU.
- i. The CMU is connected to 450 +/- 10 VAC power.
- j. The CMU rear electrical enclosure door is open to permit viewing of the PLC module indicator lights.
- k. The display unit cover is loose to permit access to the function keypad.
- l. The CMU side and front guards are off.

4.2 PLC INITIALIZATION.

- a. Close the CMU door if it is open. Close the safety cover if it is open.
- b. If the CMU is energized, turn off 450 VAC power to the CMU.
- c. Press the EMERGENCY STOP push-button on the pendant controller.
- d. Turn on 450 VAC power to the CMU.
- e. Record the PLC and Display Unit program version number as displayed on the startup screen on the display unit (DU1).

PLC: PCMU_____ DISPLAY: PCDU_____

- f. Verify that the red PROBLEM INDICATED and white POWER ON indicators on the rear electrical enclosure are lit.
- g. Verify the display unit message is: 08) PULL OUT E-STOP THEN Press RESET.
- h. Verify that the PLC PWR, OK, and RUN indicators are lit. Verify that the BATT light is off.
- i. Measure the voltage at the CMU transformer primary terminals H1 to H2. The voltage should be between 440 and 460 VAC. Record this reading: _____ VAC.
- j. Measure the voltage at the CMU transformer secondary terminals X1 to X2. The voltage should be between 110 and 120 VAC. Record this reading: _____ VAC
- k. Pull out the EMERGENCY STOP push-button on the CMU pendant controller. Verify that the red PROBLEM INDICATED indicator goes out and the white POWER ON indicator remains lit.
- l. Verify the display unit message is: 02) MACHINE SHUTDOWN, PRESS RESET.

4.3 PLC I/O CHECK

4.3.1 RESET Pushbutton.

- a. Press the RESET pushbutton.
- b. Verify that PLC slot 1, light A2 lights while the RESET pushbutton is held.
- c. Verify that the master control relay (1R1) has energized (PLC slot 1, light A1 lights).
- d. Verify that the air blocking valve solenoid has energized (PLC slot 3, light A5 lights)

Note: If the ram is not fully retracted, it will retract. If the door is locked, it will unlock.

- e. Verify the display unit message is E) OPEN COVER
- f. Press and hold the RESET pushbutton. Verify the message 05) ALREADY RESET is displayed while the RESET pushbutton is held.
- g. Verify the message E) OPEN COVER

4.3.2 PROCESS pushbutton.

- a. Open the safety cover. Verify message F) OPEN DOOR TO LOAD
- b. Open the door. Verify the message G) PREP. CHAMBER, LOAD & CLOSE DOOR
- c. Press the PROCESS pushbutton.
- d. Verify that PLC slot 1, light A3 lights while the PROCESS pushbutton is held.
- e. Verify that the following message is displayed while the PROCESS pushbutton is held: 14) CLOSE DOOR TO PROCESS.
- f. Close the door. Verify message H) CLOSE COVER.
- g. Press the PROCESS pushbutton.

- h. Verify the following message is displayed while the PROCESS pushbutton is held: 13)CLOSE COVER to PROCESS.

4.3.3 EJECT Pushbutton.

- a. Close the safety cover. Door will lock.
- b. Push the EJECT pushbutton. Verify the ram does not move. Verify the following message is displayed while the EJECT button is pushed: “10) OPEN COVER TO EJECT.”
- c. Press the RESET pushbutton. The door will unlock. Verify message E) OPEN COVER.
- d. Open the safety cover. Verify the following message is displayed: F) OPEN DOOR TO LOAD.

CAUTION

If the ram moves when the EJECT pushbutton is pushed in the next step, immediately push in the EMERGENCY STOP pushbutton and troubleshoot. If the ram is allowed to move against the unlocked door, damage to the CMU is likely.

Leave the door closed and again push the EJECT pushbutton. Verify the ram does not move. Verify the following message is displayed while the EJECT button is pushed: “09) OPEN DOOR TO EJECT.”

- e. Open the door. Verify the following message is displayed: G) PREP. CHAMBER, LOAD & CLOSE DOOR.
- f. Press the EJECT pushbutton.
- g. Verify that PLC slot 1, light A4 lights while the EJECT pushbutton is held.
- h. Verify that the ram extend solenoid energizes (PLC slot 3, light A3 lights) when the EJECT pushbutton is pressed.
- i. Verify that the ram moves up in the chamber.
- j. Verify that LS4 de-energizes as the ram moves from the fully retracted position (PLC slot 1, light B1 goes out).
- k. Verify that the ram extend solenoid de-energizes (PLC slot 3, light A3 goes out) after approx. 5 seconds.
- l. Verify the following message is displayed: A) READY to RESET

4.3.4 Ventilation Flow Switch.

- a. Verify that PLC slot 1, light A5 is off.
- b. Turn on the exhaust ventilation fan to the CMU. Verify that PLC slot 1, light A5 lights.
- c. Turn ventilation off. Verify that PLC slot 1, light A5 goes out.

4.3.5 Retract Ram. Press function key F7 (RETRACT RAM) on the display unit.

Verify that PLC slot 3, light A4 lights while function key F7 is held.

Verify that the display unit message is F7) RAM RETRACTING while the function key is held.

Verify that the ram moves down in the chamber.

When the ram is fully retracted, verify that LS4 activates (PLC slot 1, light B1 lights).

Verify the following message is displayed: G) PREP CHAMBER, LOAD, & CLOSE DOOR.

4.3.6 Extend Ram. Press function key F6 (EXTEND RAM) on the display unit.

- a. Verify that PLC slot 3, light A3 lights while function key F6 is held.
- b. Verify that the display unit message is F6) RAM EXTENDING while function key F6 is held.
- c. Verify that the ram moves up in the chamber.
- d. Verify the following message is displayed: A) READY to RESET

4.3.7 Blocking Valve.

- a. Press function keys F6 and F7 simultaneously. Verify that the blocking valve solenoid de-energizes (PLC slot 3, light A5 goes out).
- b. Verify the following message is displayed: F6/F7) BLK VALVE CLOSED – RESET or F8.
- c. Press function key F7 for 1 to 2 seconds and release. The ram should move down while the function key is held and stop when the function key is released.
- d. Press and hold function key F7 until the ram is fully retracted (PLC slot 1, light B1 lights).
- e. Press function key F6 for 1 to 2 seconds and release. The ram should move up while the function key is held and stop when the function key is released.
- f. Press function key F8 on the display unit. Verify that the blocking valve solenoid energizes (PLC slot 3, light A5 lights). The ram will move up to the eject position.
- g. Verify the following message is displayed: F8) BLOCKING VALVE OPEN. After a few second delay, the following message will appear: A) READY TO RESET.
- h. Press F6 and F7 simultaneously. Verify message F6/F7: BLK VALVE CLOSED – RESET or F8.
- i. Press the RESET pushbutton. Verify that the ram fully retracts and the following message is displayed: G) PREP CHAMBER, LOAD, & CLOSE DOOR.

4.3.8 Door Closed Limit Switch LS1.

- a. Close the door slowly. Verify that when the bottom of the door is 1.00 to 3.00 inches above the top of the chamber, limit switch LS1 energizes (PLC slot 1, light A6 lights).
- b. Fully close the door.
- c. Verify the following message is displayed: H) CLOSE COVER.

4.3.9 Safety Cover Closed Limit Switch LS2.

- a. Close the safety cover slowly. Verify that when the safety cover is fully closed, limit switch LS2 energizes (PLC slot 1, light A7 lights).
- b. After LS2 energizes, the door lock solenoid is automatically energized. Verify that PLC slot 2, A6 lights.

- c. Verify the following message is displayed while the door is locking: I) DOOR LOCKING. (Note: This event may occur too fast for message "I" to be displayed.)
- d. Verify slot 1, light A8 is lit (door locked).
- e. Verify the following message is displayed when the door is locked: J) READY TO PROCESS, RESET OR SHUTDOWN

4.3.10 Door Unlock.

- a. Open the safety cover.

Note: Step "c" must be performed within 20 seconds of step "b" or the CMU will go into problem shutdown mode.

- b. Verify that the alarm horn sounds for 2 seconds and the following message is displayed: 27) CLOSE COVER WHILE DOOR IS LOCKED.
- c. Press function key F9 (DOOR UNLOCK) on the display unit keypad.
- d. Verify that the door unlock solenoid energizes (PLC slot 2, light A7 lights).
- e. Verify the following message is displayed while the function key is held: F9) FORCE DOOR TO UNLOCK.
- f. As the door rotates to unlock, verify that limit switch LS3 de-energizes (PLC slot 1, light A8 goes out).
- g. Verify the following message is displayed after the door is unlocked: F) OPEN DOOR TO LOAD.

4.3.11 Door Heaters.

- a. Open the door.
- b. Press and hold function key F2 (ACTIVATE DOOR HEATERS) on the display unit.
- c. Verify that PLC slot 3, light A1 lights.
- d. Verify that the display unit message is F2) DOOR HEATER ON.
- e. Verify that the door surface begins to warm.

WARNING

Working on energized electrical equipment could lead to death or injury from electrical shock.

- d. Using a clamp on ammeter, measure the current in the door heater leads 1KD-L1, 1KD-L2, and 1KD-L3. The current value should be between 13.5 and 15.5 amps. Record current readings:
DOOR HEATER: L1 _____ Amps, L2 _____ Amps, L3 _____ Amps

4.3.12 Ram Heaters.

- a. Press and hold function key F3 (ACTIVATE RAM HEATERS) on the display unit
- b. Verify that PLC slot 3, light A2 lights.
- c. Verify that the display unit message is F3) RAM HEATER ON.
- d. Verify that the ram surface begins to warm.

WARNING

Working on energized electrical equipment could lead to death or injury from electrical shock.

- e. Using a clamp on ammeter, measure the current in the ram heater leads 1KR-L1, 1KR-L2, and 1KR-L3. The current value should be between 16.5 and 18.5 amps. Record current readings:
RAM HEATER: L1 _____ Amps, L2 _____ Amps, L3 _____ Amps

4.3.13 Door Lock.

- a. Close the door.
- b. Press function key F10 on the display unit keypad. Verify that the door lock solenoid energizes (PLC slot 2, light A6 lights).
- c. Verify that the door rotates to lock.
- d. Verify the following message is displayed while pressing the function key: F10) FORCE DOOR TO LOCK
- e. Close the safety cover within 20 seconds or a problem shutdown will be initiated.
- f. Verify message J) READY TO PROCESS, RESET, SHUTDOWN

4.3.14 Eject Counter.

- a. Press function key F4 on the display unit keypad. Verify the following message is displayed: F4) EJECT COUNTER COUNT = _____.

4.3.15 Cooling Water Valve.

- a. Press function key F5 on the display unit keypad. Verify the following message is displayed while the function key is held: F5) COOLING WATER ON.
- b. Verify that the cooling water solenoid energizes (PLC slot 2, light A5 lights).
- c. Verify that cooling water flows through the AU/CMU cooling loop and exits at the drain flange (upper flange) on the AU.

4.3.16 Lamp Check.

- a. Press and hold function key F11 on the display unit keypad. Verify the following message is displayed: F11) TEST LAMP AND AUDIBLE ALARM.
- b. Verify the Problem Indicated lamp is lit and PLC slot 2, light A1 is lit.
- c. Verify the audible alarm is sounding and PLC slot 3, light A6 is lit.

4.3.17 Solenoid Fuse F10.**WARNING**

Working on energized electrical equipment could lead to death or injury from electrical shock.

Verify that PLC slot 1, light B5 is lit

Open the fuse holder for fuse F10.

Verify that PLC slot 1, light B5 is not lit.

Verify that the alarm horn sounds for 2 seconds and the display unit message is 37) CHECK SOLENOIDS & FUSE F10.

Close the fuse holder for fuse F10.

Verify that PLC slot 1, light B5 lights.

4.3.18 Pressure Switch.

- a. Verify that PLC slot 1, light B8 is lit.
- b. Bleed the air pressure from the Auxiliary Unit.
- c. Verify that PLC slot 1, light B8 goes out.
- d. After approximately a 5 second delay, verify the following message is displayed: 06) SHIP'S SERVICE AIR PRESSURE LOW.
- e. Restore air pressure to the Auxiliary Unit.
- f. Verify that message "06" goes away and that PLC slot 1, light B8 is lit.

4.4 CYCLE VERIFICATION.

- a. Turn off the ventilation to the CMU.
- b. Record the number on the rear electrical enclosure eject counter. Eject Count: _____
- c. Press the RESET pushbutton.
- d. If the CMU is hot (chamber temp above 130° F), cooling will be initiated. Verify the following message is displayed during cooling: B) COOLING.
- e. If the ram is not fully retracted, the ram will retract. Verify the following message is displayed while the ram is retracting: "D) RAM RETRACTING."
- f. If the door is locked, the door will unlock. Verify that the following message is displayed while unlocking: "C) DOOR UNLOCKING."
- g. If the CMU is already reset, the following message will be displayed when the RESET button is pressed: 05) ALREADY RESET
- h. When the CMU is reset, verify the following message is displayed: "E) OPEN COVER."
- i. Open the safety cover. Verify the following message is displayed: "F) OPEN DOOR TO LOAD."
- j. Open the door. Verify the following message is displayed: "G) PREP. CHAMBER LOAD & CLOSE DOOR."
- k. Close the door. Verify the following message is displayed: "H) CLOSE COVER."
- l. Close the safety cover. Verify that the door automatically locks. Verify the following message is displayed while the door is locking: "I) DOOR LOCKING." (Note: This event may occur too fast for message "I" to be displayed).

- m. After the door is locked, verify the following message is displayed: “J) READY TO PROCESS, RESET OR SHUTDOWN.”
- n. Press and hold the PROCESS pushbutton. Verify the alarm horn sounds for 2 seconds and the following message is displayed: “25) VENTILATION OFF.”
- o. Turn on the exhaust ventilation to the CMU.
- p. Press the PROCESS pushbutton. The ram will move up and compress against the locked door. Verify the following message is displayed: “P) PACKING CHAMBER TIME LEFT ____ SEC.”
- q. The ram packing timer will count down for 25 seconds. At the end of the countdown, the ram will retract. Verify the following message is displayed: “D) RAM RETRACTING.”
- r. When the ram is fully retracted, the door will unlock. Verify the following message is displayed: “C) DOOR UNLOCKING.” (Note: This event may occur too fast for message “C” to be displayed).
- s. When the door is unlocked, the following message will be displayed: “E) OPEN COVER.”
- t. Open the safety cover. The following message will then be displayed: “N) OPEN DOOR TO RELOAD.”
- u. Open the door. The following message will then be displayed: “O) LOAD ADD’L MAT’L, THEN CLOSE DOOR.”
- v. Close the door. Verify the following message is displayed: H) CLOSE COVER.”
- w. Close the safety cover. Verify the following message is displayed: “I) DOOR LOCKING.” (Note: Again you may not be able to see this message as locking occurs too fast). The door will automatically lock.
- x. When the door is fully locked, verify the following message is displayed: “J) READY TO PROCESS, RESET OR SHUTDOWN.”
- y. Press the PROCESS pushbutton. Verify the following message is displayed for approximately 5 seconds while the ram is extending: “M) RAM EXTENDING.”
- z. When the ram is extended, the ram and door will begin heating to approximately 350° F. Verify the message display changes to the following message: “K) HEATING.”
- aa. The chamber thermostat TS3 trips open when the temperature of the chamber reaches approximately 150° F. Verify that PLC slot 1, light B4 goes out.
- bb. The door (TS1) and ram (TS2) thermostats open when the temperature of their respective devices reaches approximately 350° F. Verify that PLC slot 1, lights B2 and B3 go out.
- cc. When both TS1 and TS2 are open, a 10-minute cook timer will start. Verify the following message is displayed: “L) PROCESS TIME LEFT 00:__:__”
- dd. When the cook timer times out, the PLC turns off the heaters if they are on and opens the cooling water isolation valve on the AU. Verify the following message is displayed: “B) COOLING”
- ee. Verify cooling water is flowing thru the CMU.
- ff. Soon after cooling begins, the door and ram thermostats will close. Verify that PLC slot 1, lights B2 and B3 light.

- gg. When the chamber has cooled to approximately 130° F, the chamber thermostat TS3 will close (PLC slot 1, light B4 will light) and cooling will stop. Verify that the cooling water valve closes and the following message is displayed: “D) RAM RETRACTING.”
- hh. When the ram has fully retracted, the door will unlock. Verify the following message is displayed: “C) DOOR UNLOCKING.” (Note: This event may occur too fast for message “C” to be displayed).
- ii. If the door does not unlock after it has been signaled to unlock for approximately 7 seconds, the following message will be displayed: “31) DOOR STUCK SHUT, OPEN MANUALLY.”
- jj. If the door unlocks normally, the alarm horn will sound to signal the operator that the process cycle is complete. Verify the following message is displayed: “E) OPEN COVER.”
- kk. Open the safety cover. Verify the alarm horn stops sounding and the following message is displayed: “Q) OPEN DOOR.”
- ll. Open the door. Verify the following message is displayed: “R) READY TO EJECT OR RESET.”
- mm. Press the EJECT pushbutton. The ram will extend to the eject position. Verify the following message is displayed: “T) RAM EJECTING DISK NO. ____.” Record the disk number displayed.
- nn. The ram moves to a position approximately 1/2- inch above the top of the chamber. Verify the following message is displayed: “U) REMOVE DISK, THEN PRESS RESET.”
- oo. Press the RESET pushbutton. Verify the following message is displayed: “D) RAM RETRACTING.”
- pp. When the ram reaches the fully retracted position, verify the following message is displayed: “G) PREP. CHAMBER, LOAD & CLOSE DOOR.”
- qq. Record the number on the mechanical eject counter, 1EC1. Eject Count:_____
- rr. Close the door.
- ss. Close the safety cover. The door will automatically lock. When the door is locked, the following message will be displayed: “J) READY TO PROCESS, RESET or SHUT DOWN.”

4.5 SHUNT TRIP VERIFICATION

- a. Attach a 115 VAC test light or LED across terminals 1TB3-10 and 1TB3-11 in the rear electrical enclosure.
- b. Press function keys F2 and F3 simultaneously. Verify that the following message is displayed: “03) NQB TEST.”
- c. After a few second delay, verify that PLC slot 2, light A8 lights and the test light attached in step “a” above lights.
- d. Turn off 450 VAC power to the CMU.
- e. Restore 450 VAC power to the CMU and allow the PLC to complete its initialization process.
- f. Remove one of the TS4 leads from 1TB3-8. Verify the following message is displayed: 32) HIGH TEMP SHUTDOWN, RESET WHEN COOL.
- g. After a 2-minute time delay, the message will change to the following: 33) HI TEMP, NO COOL TURN OFF CMU POWER.

- h. After a 30-second delay, verify that PLC slot 2, light A8 lights and the test light attached in step “a” above lights.
- i. Turn off 450 VAC power to the CMU.
- j. Reattach the LS4 lead that was removed in step “f” above.
- k. Restore 450 VAC power to the CMU and allow the PLC to complete its initialization process.
- l. Remove one of the TS5 leads from 1TB3-9. Verify the following message is displayed: 32) HIGH TEMP SHUTDOWN, RESET WHEN COOL.
- m. After a 2-minute time delay, the message will change to the following: 33) HI TEMP, NO COOL TURN OFF CMU POWER.
- n. After a 30-second delay, verify that PLC slot 2, light A8 lights and the test light attached in step “a” above lights.
- o. Turn off 450 VAC power to the CMU.
- p. Reattach the LS5 lead that was removed in step “f” above.
- q. Restore 450 VAC power to the CMU and allow the PLC to complete its initialization process.
- r. Remove 120 VAC power from the PLC by removing lead 1FL1-3/1TB1-2 from the power line filter 1FL1.
- s. Remove one of the TS4 leads from 1TB3-8. Verify that after a 3-minute time delay, the test light attached in step “a” above lights.
- t. Turn off 450 VAC power to the CMU.
- u. Re-attach lead 1FL1-3/1TB1-2 to the power line filter 1FL1. Reinstall the TS4 lead in 1TB3-8. Remove the test light.

4.6 WASHDOWN NOZZLE VERIFICATION

- a. Turn on 450 VAC power to the CMU.
- b. Pull out the E-STOP pushbutton and press RESET.
- c. Open the safety cover and door.
- d. Press the EJECT pushbutton to move the ram to the eject position.
- e. Turn off 450 VAC power to the CMU.
- f. Remove the pendant controller from the CMU and stow it atop the rear electrical enclosure.
- g. Attach a garden hose to the hose fitting (ref. 1, pc 132) on the washdown manifold (ref. 1, pc 60). Turn on the hose and observe that water is flowing from all nine cleaning nozzles.
- h. Turn off and remove the garden hose.

5.0 SECURING FOR SHIPPING.

- a. Turn on 450 VAC power to the CMU.

- b. Press the RESET pushbutton to fully retract the ram.
- c. Close the door and safety cover and allow door to lock.
- d. Turn off and disconnect 450 VAC power to the CMU.
- e. Turn off and disconnect the cooling water to the AU.
- f. Turn off and disconnect the shop air to the AU.
- g. Turn off and disconnect the exhaust ventilation to the CMU.
- h. Secure the door on the CMU rear electrical enclosure.
- i. Secure the cover on the display unit.
- j. Disconnect all interconnecting cables between the CMU and the CMU rear electrical enclosure. Disconnect the interconnecting cable between the CMU and the AU electrical enclosure. Wrap the connector plugs in bubble wrap or equivalent protective material. Secure the cables to the rear of the CMU with wire ties.
- k. Attach the pendant control enclosure to the receiver brackets on the front of the CMU. Secure the pendant in place with tie wraps or tape.
- l. Disconnect the interconnecting hoses between the CMU and the AU. Using shop air, blow the remaining water from the CMU cooling loop. Apply a protective cover on the 37° sealing surface and threads of the fittings.
- m. Reinstall the side and front guard